

CLAIMS

We claim :

5           1. In a process for the use of a hydrocarbon feedstock by reacting the feedstock in a reactor with oxygen to form a synthesis gas containing at least carbon monoxide, carbon dioxide and hydrogen and subjecting the synthesis gas to a conversion process comprising an exothermic reaction producing dimethyl ether in a converter, the converter operating at an operating pressure, said oxygen being provided to the reactor at an oxygen pressure following separation of cooled compressed air compressed in at least one air compressor, the improvement consisting in that the synthesis gas is produced at a pressure such that the synthesis gas is sent from the reactor to the converter without undergoing a compression step, and the air separation unit supplies oxygen to the reactor at an oxygen pressure greater than the operating pressure of the reactor.

10           2. The process of Claim 1 wherein the synthesis gas is produced at a pressure at least 1 bar higher than the operating pressure of the converter.

15           3. The process according to Claim 1 wherein the hydrocarbon feedstock is natural gas.

20           4. The process according to Claim 1 wherein dimethyl ether and at least one of methanol, carbon dioxide and unreacted synthesis gas are present at the outlet of the converter.

25           5. The process according to Claim 4 wherein the exothermic reaction produces dimethyl ether by a direct process.

30           6. The process according to Claim 4 wherein the exothermic reaction produces dimethyl ether by an indirect process, by converting synthesis gas to methanol and then converting the methanol to dimethyl ether.

7. The process according to Claim 4 wherein the converter produces a mixture of methanol and dimethyl ether, the mixture is separated to produce substantially pure dimethyl ether and substantially pure methanol and the substantially pure methanol is recycled to an inlet of the converter.

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8. The process according to Claim 4 wherein carbon dioxide is present at the outlet of the converter and carbon dioxide produced by the converter is recycled to an inlet of the reactor following compression in a carbon dioxide compressor.

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9. The process according to Claim 8 wherein at least one of the carbon dioxide compressor and an air compressor and an air booster is coupled to a steam turbine.

15 10. The process according to Claim 4 wherein unreacted synthesis gas is present at the outlet of the converter and unreacted synthesis gas produced by the converter is recycled to an inlet of the converter following compression in a recycle synthesis gas compressor.

20 11. The process according to Claim 10 wherein at least one of the recycle synthesis gas compressor and an air compressor and an air booster is coupled to a steam turbine..

25 12. The process according to Claim 1 wherein the hydrocarbon feedstock reacts with the oxygen in a partial oxidation reactor.

13. The process according to Claim 1 wherein the hydrocarbon feedstock reacts with the oxygen in an autothermal reactor.

30 14. In an apparatus for the use of a hydrocarbon feedstock by reacting the feedstock in a reactor with oxygen to form a synthesis gas containing at least carbon monoxide, carbon dioxide and hydrogen: a reactor, a feedstock conduit for sending the feedstock to the reactor, an oxygen conduit for sending the oxygen to the reactor, a synthesis gas removal conduit for removing synthesis

gas from the reactor, said synthesis gas removal conduit being connected to a converter for subjecting the synthesis gas to a conversion process to produce dimethyl ether comprising an exothermic reaction in a converter, the converter operating at an operating pressure, said oxygen being provided by air separation at an oxygen pressure; the improvement consisting in that there is no synthesis gas compressor for compressing the synthesis gas which is produced by the reactor and which is to be sent to the converter.

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15. The apparatus according to Claim 14 comprising a steam turbine and at least one of at least one air compressor for compressing air to be separated to form oxygen, at least one air booster for further compressing air to be separated to form oxygen, a carbon dioxide compressor for compressing carbon dioxide sent from the converter to the reactor and a recycle synthesis gas compressor for compressing unreacted synthesis gas sent from the converter to upstream the converter, said steam turbine being coupled to at least one of the recycle synthesis gas compressor, the carbon dioxide compressor and an at least one air compressor and an air booster.

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